AUTOMOTIVE HVAC AND CABIN COMFORT SENSORS

Cabin Comfort Systems

Sensata Technologies

The World Depends on Sensors and Controls

The supplier you want.
The partner you need.

At Sensata we do everything in our power to ensure your personal satisfaction. We apply our unsurpassed experience and expertise to focus on your needs. We adhere to technical, manufacturing and testing standards that are second to none. And our experts work with your experts to ensure the quality and precision it takes to meet the most demanding application requirements. No wonder a world of businesses rely on the more than 600 million Sensor and Control devices we manufacture each year to hone their own leading-edge technologies.

The Sensata Technologies success story.

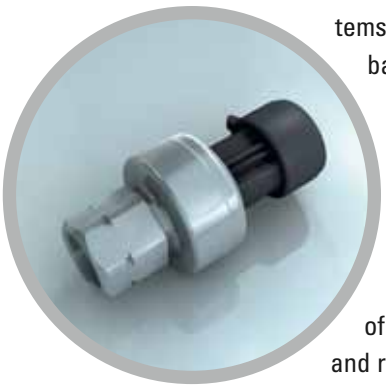
It began in 1959. And although we have evolved over the years, we have always had one goal: to provide leaders in automotive, appliance, aircraft, industrial, HVAC, and other markets the sensors and controls they require to succeed. From our headquarters in Attleboro, Massachusetts to our manufacturing centers around the world, from our regional warehouses to our network of sales offices spanning the globe, we help businesses everywhere to make their products safer, more effective and efficient. Every day.

Sensata Technologies

CABIN COMFORT SENSORS

Advanced Sensing Solutions for Tomorrow´s HVAC Systems

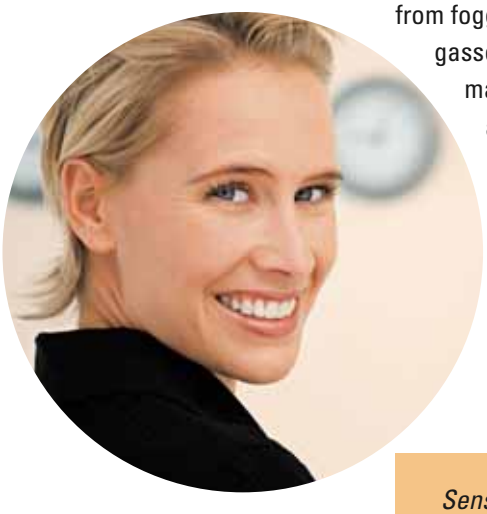
Air-conditioning systems, being the single largest auxiliary load on the vehicle, reduce fuel economy. Emission standards are providing the impetus for the HVAC industry to evaluate new climate control concepts. Solutions for size reduction of the climate control systems lie in re-evaluating the glazing systems, but more importantly in developing advanced techniques for delivering heating and cooling to the occupants. The sensor industry is driven by the need for fast response, and more sensitive sensors for monitoring the thermal comforts in the new designs of HVAC systems. Recirculation of cabin air, in an attempt to reduce the outside air take-up, also calls for the need of highly sensitive, fast response, low cost and maintenance-free gas analyzers and humidity sensors.



Where contemporary HVAC systems provide accurate, but basic, temperature control, the near future will see cars will increasingly fitted with sophisticated systems, that will control the entire cabin atmosphere with the help of humidity, air quality, light and radiation sensors.

Global Insight forecasts that the worldwide take-rate of AC in cars will increase from 75% in 2006 to close to 85% in 2012.

Every day Sensata produces 300,000 automotive sensors.



Combined, these sensors will be able to provide the best possible environment for people inside cars, in terms of comfort and safety. Radiation and light sensors will help understand when and where to apply additional heating, ventilation or air conditioning of the driver or passengers, humidity sensors will help control the optimal humidity setting inside cars, at the same time preventing windows from fogging up. Air quality sensors will detect undesired gasses and odours outside as well inside the car, automatically triggering actuators to adjust the flow of air in and out of the cabin.

Sensata Technologies offers state-of-the-art sensor solutions for tomorrow's cabin comfort systems.

Sensata produces the largest number of pressure sensors for automotive HVAC systems worldwide.

ESTIMATED ABSOLUTE GAS CONCENTRATIONS

In Sensata's ACM, changes in resistance are converted into an output voltage by means of micro processor based electronics. Resistance and associated changes generate the fundamental input for an internal algorithm that first converts the sensing elements' signals to estimated absolute gas concentrations of target gases (CO, HC, NOx and Volatile Organic Compounds, or VOCs). Based on these estimates and recent history of the signals, the concentrations are converted into a classification level from 0 to 5, where the number of classification levels is a custom parameter that can be modified. This classification is encoded in a PWM or LIN signal that is transferred to the AC controller.

Air Quality Sensor

Sensata's Air Classification Module (ACM) measures the concentration of gases using MetalOxide Semiconductor (MOS) technology where oxide-based thick films are deposited onto silicon micromachined substrates. These microsensors are equipped with electrodes that enable extremely accurate measurement of the resistance of the sensing layer. To ensure quick, sensitive, and selective detection, heaters are incorporated into the substrate. Changes in the composition of the ambient atmosphere will result in chemical processes in the sensing layer that create a change in resistance, allowing the sensor to detect a wide range of toxic and explosive gases even at very low concentrations.

Sensata's ACM provides drivers and passengers with the best possible protection against all common traffic exhaust gases: Carbon Oxide (CO) and Hydrocarbon (HC), typically produced by gasoline engines as well as Nitrogen Oxide (NOx), produced by diesel engines. In addition the ACM detects a wide variety of Volatile Organic Compounds

Analysts predict that in 2010 one in every 4 or 5 new passenger cars will be equipped with humidity and air quality sensors.

(VOCs), which build up smells. Apart from the occurrence of the gas event, the ACM consistently tracks the duration of the event as well, even when the background gas concentration gradually increases, as is the case when driving in tunnels or underground parking lots. The ACM will allow for optimal recirculation valve operation, not before and certainly not after unwanted gases would enter the cabin.

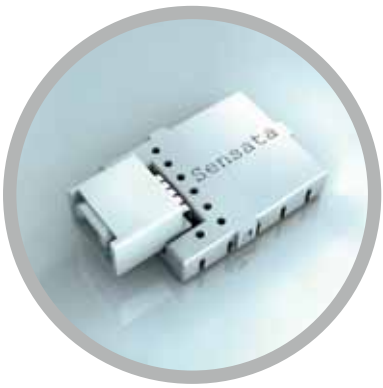
Dew Point Sensors

Sensata's Relative Humidity (RH) and Dew Point sensors are based on a polymer capacitive type sensing technology, similar to the technology used in the pressure sensors that Sensata has been producing for many years. The humidity in the probed air changes the dielectric capacity of the polymer layer in the sensing element. The change in capacity of the RH sensing element is subsequently converted into a calculated relative humidity and with the help of accurate NTC elements, a dew point is calculated.

For calculating the dewpoint of the incoming air, a capacitive polymer humidity sensing element and a temperature sensing element are integrated on a printed circuit board which is mounted in a plastic housing. For the humidity

sensing element, a state of the art capacitive sensing element is used of which the capacitance varies with the relative humidity of the surrounding air. The temperature sensing element uses an accurate NTC thermistor. Both sensing elements are mounted on the backside of a printed circuit board and an O-ring is used to realize a sealed cavity to only expose the sensing elements to the surrounding air. A membrane which is permeable for humidity (but not for water) is used to guarantee the function under all circumstances and make the total sensor housing water tight.

For signal conditioning a micro processor is used to measure the humidity sensing element capacity and the thermistor resistance. The capacitance measurement is based on the same principle Sensata uses for the capacitive ceramic pressure transducers millions of which have been in produced since 1987. This principle is well proven and results in a very accurate measurement of relatively low capacitances.



North America

Sensata Technologies Inc.
529 Pleasant Street
ATTLEBORO, MA 02703-0964
United States of America

Tel: +1 (508) 236-3800
HVAC-NorthAmerica@list.sensata.com

Japan

Sensata Technologies Japan Ltd.
Sumito Fudosan
Nishi-Shinjuku Bldg.
8-15-17 Nishi-Shinjuku, Shinjuku-ku
TOKYO 160-0023
Japan
Tel: + 81 (3) 53 38 10 03
HVAC-Japan@list.sensata.com

Korea

Sensata Technologies Korea Ltd.
29F, Trade Tower, 159-1
SamSung-Dong, KangNam-Ku
SEOUL 135-729
Republic of Korea

Tel: + 82 (2) 5 51 32 12
HVAC-Korea@list.sensata.com

South America

Sensata Technologies Sensores e Controles Do Brasil Ltda
Rua Azarias de Melo #648 – Taquaral
CAMPINAS – SP
Brazil
Tel: + 55 (19) 37 54 11 11
HVAC-SouthAmerica@list.sensata.com

Europe

Sensata Technologies Holland B.V.
Kolthofsingel 8
7602 EM ALMELO
The Netherlands

Tel: +31 (546) 87 95 55
HVAC-Europe@list.sensata.com

China

Sensata Technologies China Co., Ltd.
Novel Plaza, 8th Floor
128 Nanjing Road West
SHANGHAI 20003
People's Republic of China
Tel: + 86 (2) 1 23 07 32 31
HVAC-China@list.sensata.com

Sensata
Technologies

The World Depends on Sensors and Controls

www.sensata.com